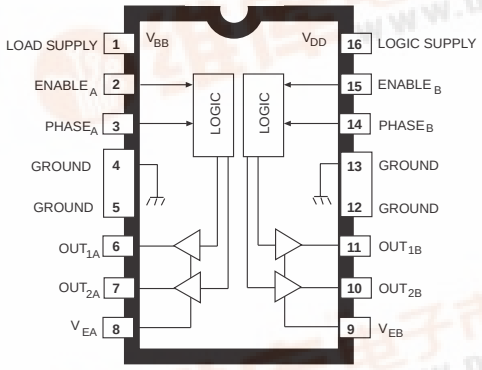
2993

Data Sheet
29319.5A

DUAL H-BRIDGE MOTOR DRIVERS

UDN2993B



Dwg. No. A-12,455

ABSOLUTE MAXIMUM RATINGS at $T_J \le +150°C$

Load Supply Voltage, V_{BB} ..... **30 V**
Logic Supply Voltage, V_{DD} ..... **7.0 V**
Logic Input Voltage Range, V_{PHASE} or V_{ENABLE} ..... **-0.3 V to V_{DD} + 0.3 V**
Output Current, I_{OUT} ..... **±600 mA**
Sink Driver Emitter Voltage, V_E ..... **1.5 V**
Package Power Dissipation, P_D ..... **See Graph**
Operating Temperature Range, T_A ..... **-20°C to +85°C**
Storage Temperature Range, T_S ..... **-55°C to +150°C**

IMPORTANT: Load supply voltage must never be applied without logic supply voltage present.

NOTE: Output current rating may be limited by chopping frequency, ambient temperature, airflow, and heat sinking. Under any set of conditions, do not exceed the specified maximum current and a junction temperature of +150°C.

Cost-effective monolithic drive electronics for bipolar stepper and dc (brush) servo motors to 30 V and 500 mA is very practical with the UDN2993B and UDN2993LB. These dual full-bridge motion control ICs integrate separate inputs, level shifting for upper power outputs, control logic, integral inductive transient protection, and source (upper) and sink (lower) drivers in an H-bridge configuration. The single-chip power IC provides improved space utilization and reliability unmatched by discrete component circuitry.

Excepting the power supply connections, the two H-bridges are independent. An ENABLE input is provided for each bridge and permits pulse-width modulation (PWM) through the use of external circuitry. PWM drive techniques provide the benefits of reduced power dissipation, improved motor performance (especially torque), and positively affect system efficiency. Separate PHASE inputs for each bridge determine the direction of current flow in the load. Additionally, each pair of (sink) emitters are terminated to package connections. This allows the use of current-sensing circuitry. Both devices incorporate an intrinsic “dead time” to preclude high crossover (or cross-conduction) currents during changes in direction (phase).

These devices are packaged in plastic DIPs (suffix B) or surface-mountable wide-body SOICs (suffix LB) with copper lead frames for optimum power dissipation without heat sinks. The lead configurations allow automatic insertion, fit standard IC sockets or printed wiring board layouts, and enable easy attachment of a heat sink for maximum power-handling capability. The heat-sink tabs are at ground potential and require no insulation.

Dual full-bridge drivers with peak current ratings of ±3 A are supplied as the UDN2998W.

FEATURES

- ±600 mA Output Current
- Output Voltage to 30 V
- Crossover Current Protection
- TTL/NMOS/CMOS Compatible Inputs
- Low Input Current
- Internal Clamp Diodes
- Automotive Capable

Always order by complete part number:

Part Number	Package
UDN2993B	16-Pin DIP
UDN2993LB	20-Lead Wide-Body SOIC

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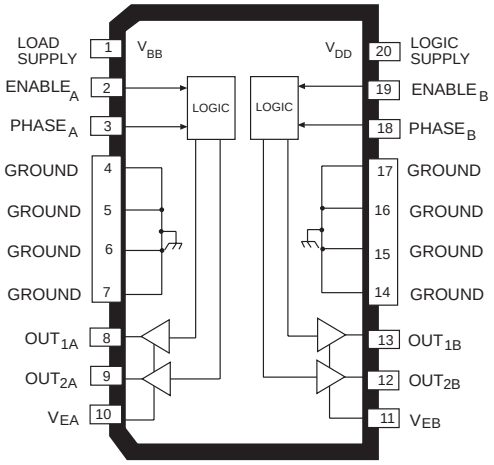
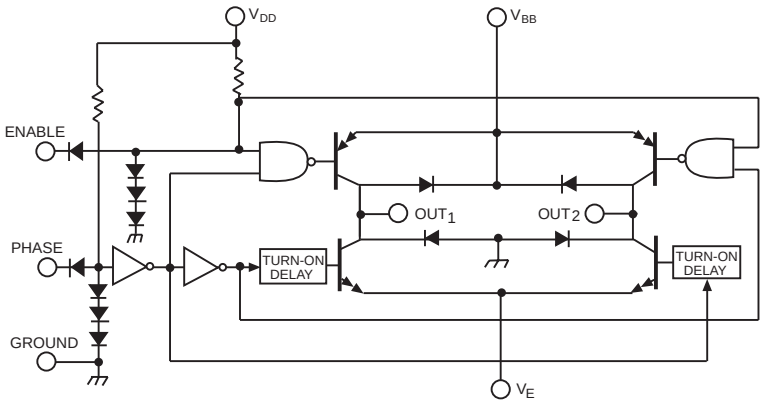
DUAL H-BRIDGE MOTOR DRIVERS

UDN2993LB



Dwg. No. A-14,340

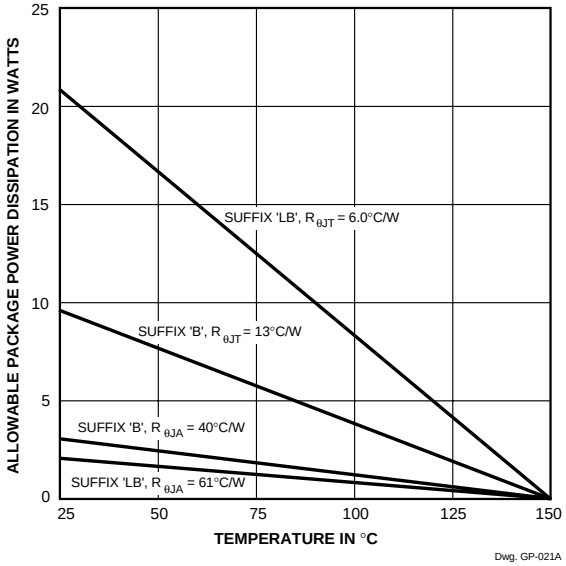
FUNCTIONAL BLOCK DIAGRAM
(One of Two Drivers)



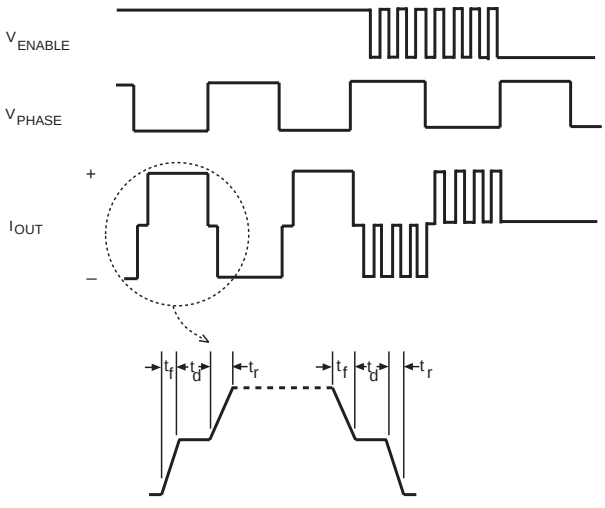
Dwg. No. A-12,447

TRUTH TABLE

Enable Input	Phase Input	Output 1	Output 2
High	High	Low	High
High	Low	High	Low
Low	High	Low	Open
Low	Low	Open	Low



Dwg. GP-021A



Dwg. No. A-12,448

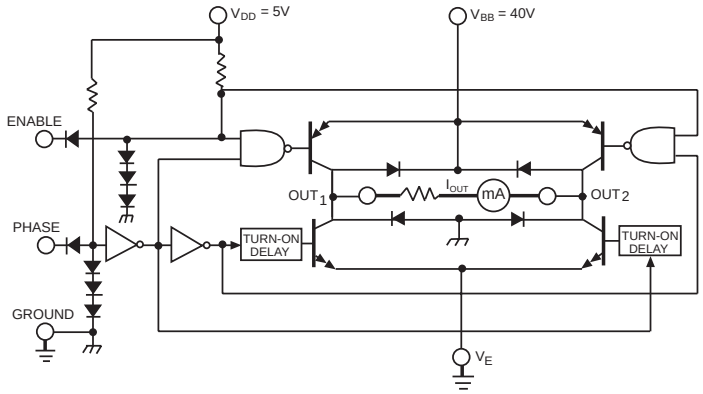
ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{BB} = 30 V, V_{DD} = 5 V, V_E = 0 V, $T_J \leq$ +150°C Figure 1 (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Output Drivers						
Operating Voltage Range	V_{BB}		10	—	30	V
Output Leakage Current	I_{CEX}	V_{ENABLE} = 0.8 V, V_{OUT} = V_{BB}, Note 2	—	< 1.0	50	µA
		V_{ENABLE} = 0.8 V, V_{OUT} = 0 V, Note 2	—	< -1.0	-50	µA
Output Saturation Voltage	$V_{CE(SAT)}$	V_{ENABLE} = 2.4 V, I_{OUT} = 500 mA	—	1.6	1.8	V
		V_{ENABLE} = 2.4 V, I_{OUT} = -500 mA	—	1.6	2.0	V
Output Sustaining Voltage	$V_{CE(sus)}$	I_{OUT} = ±500 mA, Figure 2, Note 2	30	—	—	V
Motor Supply Current	$I_{BB(ON)}$	V_{ENABLE} = 2.4 V, Outputs Open, Note 2	—	1.0	3.0	mA
	$I_{BB(OFF)}$	V_{ENABLE} = 0.8 V, Outputs Open, Note 2	—	250	300	µA
Source Driver Rise Time	t_r	I_{OUT} = -500 mA	—	75	—	ns
Source Driver Fall Time	t_f	I_{OUT} = -500 mA	—	280	—	ns
Clamp Diode Forward Voltage	V_F	I_F = 500 mA	—	1.6	1.8	V
Control Logic (PHASE or ENABLE)						
Logic Input Current	$I_{IN(1)}$	V_{PHASE} or V_{ENABLE} = 2.4 V	—	< 1.0	10	µA
	$I_{IN(0)}$	V_{PHASE} or V_{ENABLE} = 0.8 V	—	-200	-300	µA
Logic Input Voltage	$V_{IN(1)}$		2.4	—	—	V
	$V_{IN(0)}$		—	—	0.8	V
Logic Supply Current	I_{DD}		—	14	20	mA
Turn-On Delay Time	t_{pd0}	ENABLE Input to Source Drivers	—	250	—	ns
Turn-Off Delay Time	t_{pd1}	ENABLE Input to Source Drivers	—	500	—	ns

NOTES: 1. Each driver is tested separately.
2. Test is performed with V_{PHASE} = 0.8 V and then repeated for V_{PHASE} = 2.4 V.
3. Negative current is defined as coming out of (sourcing) the specified device pin.

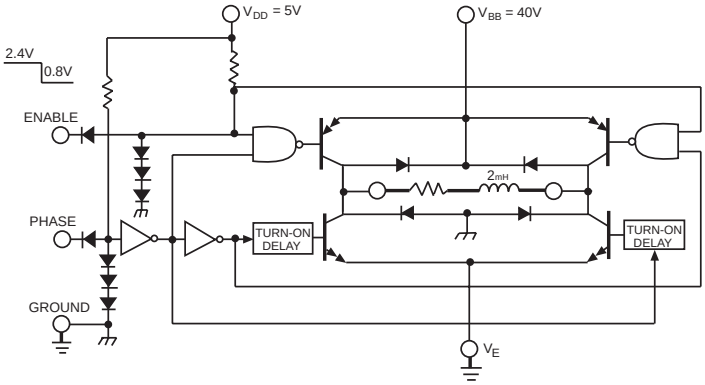
TEST FIGURES

FIGURE 1



Dwg. No. A-12,449

FIGURE 2



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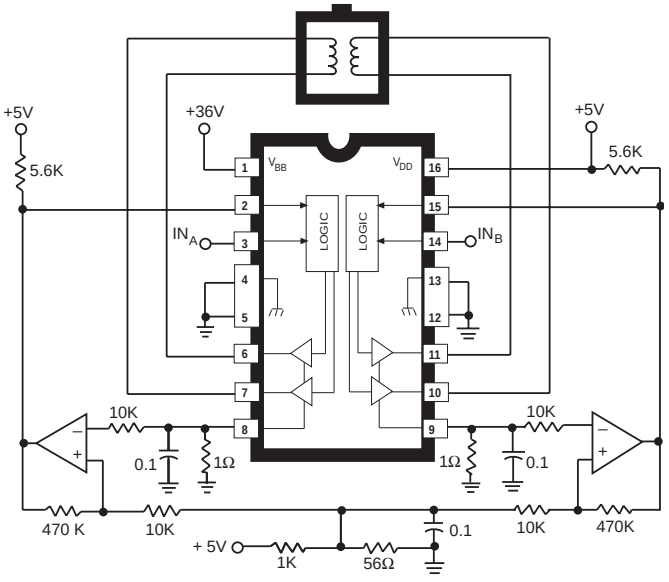
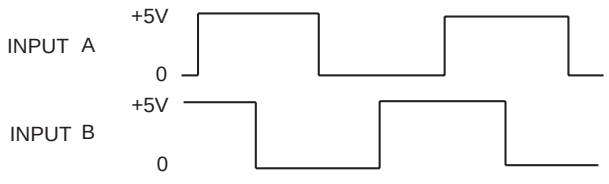
TYPICAL APPLICATION

2-PHASE BIPOLAR STEPPER MOTOR DRIVE (Chopper Mode)

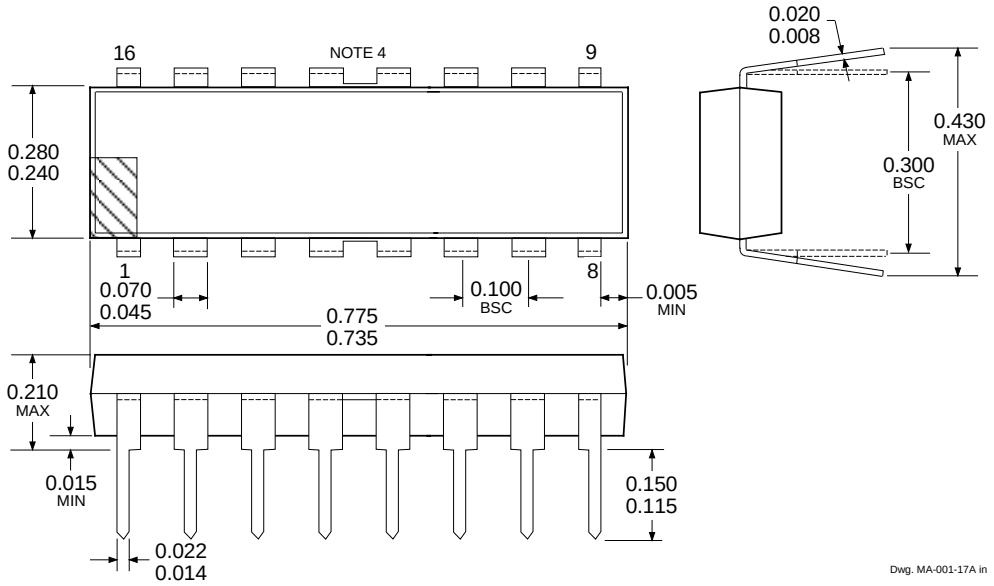


Dwg. No. A-12,453

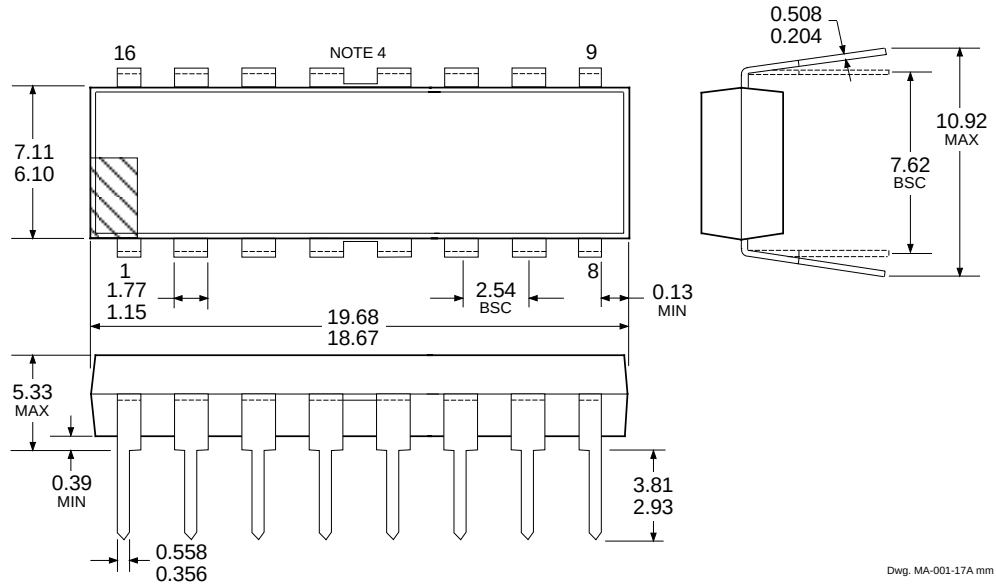


Dwg. No. A-12,454

UDN2993B
Dimensions in Inches



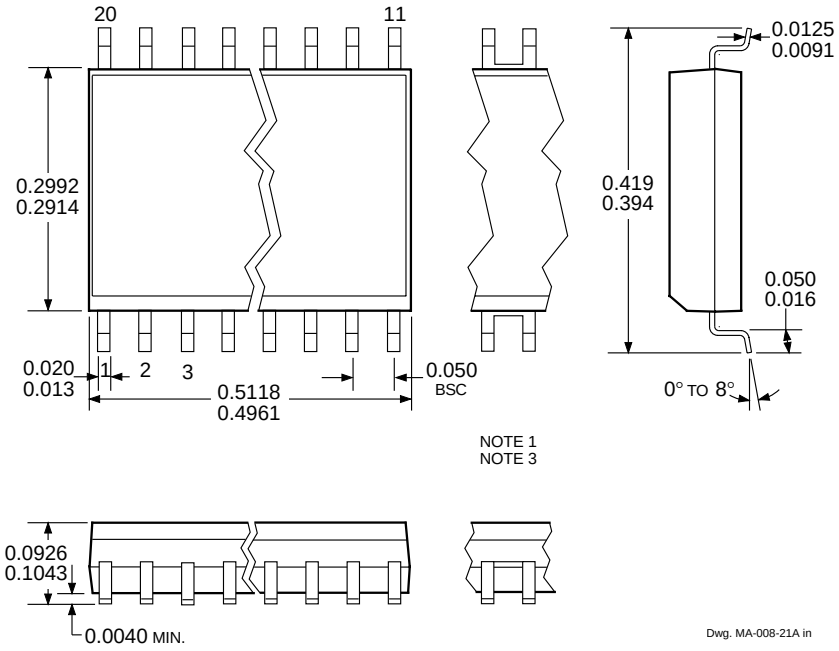
Dimensions in Millimeters
(Based on 1" = 25.4 mm)



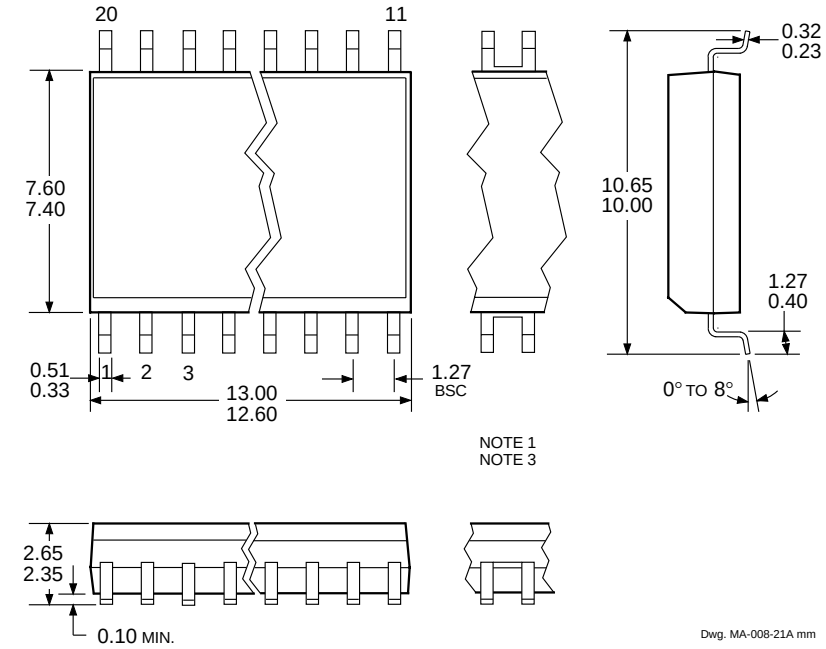
NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative
3. Lead thickness is measured at seating plane or below.
4. Webbed lead frame. Leads 4, 5, 12, and 13 are internally one piece.

UDN2993LB

Dimensions in Inches
(Based on 1 mm = 0.03937")



Dimensions in Millimeters



NOTES: 1. Webbed lead frame. Leads 5, 6, 15, and 16 are internally one piece.
2. Lead spacing tolerance is non-cumulative.
3. Exact body and lead configuration at vendor's option within limits shown.

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DUAL H-BRIDGE MOTOR DRIVERS

MOTOR DRIVERS SELECTION GUIDE

Function	Output Ratings *		Part Number †
INTEGRATED CIRCUITS FOR BRUSHLESS DC MOTORS			
3-Phase Controller/Drivers	±2.0 A	45 V	2936 and 2936-120
Hall-Effect Latched Sensors	10 mA	24 V	3175 and 3177
2-Phase Hall-Effect Sensor/Controller	20 mA	25 V	3235
Hall-Effect Complementary Output Sensor	20 mA	25 V	3275
2-Phase Hall-Effect Sensor/Driver	900 mA	14 V	3625
2-Phase Hall-Effect Sensor/Driver	400 mA	26 V	3626
Hall-Effect Comp. Output Sensor/Driver	300 mA	60 V	5275
3-Phase Back-EMF Controller/Driver	±900 mA	14 V	8902–A
3-Phase Controller/DMOS Driver	±4.0 A	14 V	8925
3-Phase Back-EMF Controller/Driver	±1.0 A	7 V	8984
INTEGRATED BRIDGE DRIVERS FOR DC AND BIPOLAR STEPPER MOTORS			
PWM Current Controlled Dual Full Bridge	±750 mA	45 V	2916
PWM Current Controlled Dual Full Bridge	±1.5 A	45 V	2917
PWM Current Controlled Dual Full Bridge	±1.5 A	45 V	2918
PWM Current Controlled Dual Full Bridge	±750 mA	45 V	2919
Dual Full Bridge Driver	±2.0 A	50 V	2998
PWM Current Controlled Full Bridge	±2.0 A	50 V	3952
PWM Current Controlled Full Bridge	±1.3 A	50 V	3953
PWM Current Controlled Dual Full Bridge	±800 mA	45 V	3961
PWM Current Controlled Dual Full Bridge	±800 mA	30 V	3962
OTHER INTEGRATED CIRCUIT & PMCM MOTOR DRIVERS			
Unipolar Stepper Motor Quad Driver	1.8 A	50 V	2544
Unipolar Stepper-Motor Translator/Driver	1.25 A	50 V	5804
Unipolar Stepper-Motor Quad Driver	1 A	46 V	7024 and 7029
Unipolar Microstepper-Motor Quad Driver	1.2 A	46 V	7042
Voice-Coil Motor Driver	±500 mA	6 V	8932-A
Voice-Coil Motor Driver	±800 mA	16 V	8958
Voice-Coil (and spindle) Motor Driver	±350 mA	7 V	8984

* Current is maximum specified test condition, voltage is maximum rating. See specification for sustaining voltage limits or over-current protection voltage limits.
Negative current is defined as coming out of (sourcing) the output.

† Complete part number includes additional characters to indicate operating temperature range and package style.

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